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## EXECUTIVE SUMMARY

This first volume of the Accreditation Support Package (ASP-I) is designed to provide a potential user with a characterization of the current status of the subject model with respect to criteria related to its general acceptability for use. The information presented in this volume should characterize the model well enough to provide an initial determination of its suitability for a particular application. It should also provide confidence that the model is well enough managed and supported to yield consistent results across its spectrum of users and applications. The information provided to characterize the subject model consists of the following elements.

- a. A description of the configuration management baseline for the model, including version history, current version status, model development policy (including beta site provisions), documentation availability, and a summary of configuration management policies, procedures, guidelines and support functions in place for the model;
- b. A summary of implicit and explicit assumptions and limitations inherent in the model because of its design and/or coding assumptions or structure, as well as any implied constraints to the use of the model that are a consequence of these assumptions or structures. A listing of known errors or anomalies found as a result of prior V&V efforts is also included;
- c. A review of the model's development, verification and validation (V&V) and usage histories, as well as a summary of prior accreditations;
- d. A review of the status of model documentation and its conformity to accepted software documentation standards, as well a review of documentation with respect to verification requirements, and;
- e. A summary of overall software quality as characterized by conformance to accepted design and coding practices.

ASP-I provides the details of these information elements in a single document. The degree to which each information element is complete and current provides a general indication of whether the model is suitable for further consideration for use in a particular application.

**Configuration Management Baseline:** This edition of the ASP-I describes the Simulated Warfare Environment Generator (SWEG) version 6.5.5. SWEG is a many-on-many combat effectiveness model which represents individual combat platforms at a system level of detail. The fundamental modeling entity is called a player which may represent one or more different platforms, and each platform is comprised of any number of eight basic system types which include: sensor transmitters, sensor receivers, communications transmitters, communications receivers, weapon systems, countermeasure systems (disruptors), thinker systems, and mover systems. Other attributes, such as signature and tactical decision-making, including maneuver decisions, target assignment, target engagement, emission control (EMCON), and message generation, are also user-defined.

In addition to the use of SWEG in a (constructive) stand-alone mode, SWEG can also be used in a virtual mode which allows the control and coordination of external assets including other simulations and hardware-in-the-loop (HITL) by means of model interfaces. In these applications, SWEG supports the test and evaluation of external

hardware assets and functions as an executive controller which maintains status information on scenario players, provides stimuli to, and receives responses from, the external assets.

SWEG is owned and controlled by the Air Combat Environment Test and Evaluation Facility (ACETEF) at The Naval Air Warfare Center - Aircraft Division (NAWC-AD), located at Patuxent River, MD. In the past SWEG was used primarily as an ACETEF in-house model to control various external assets, and management has been informal. In response to increased interest by outside users, ACETEF has recently developed a model management plan which treats model development and configuration management more formally. To date the plan has not yet been completely implemented, and it is too early to tell how effective the management plan and its implementation will be.

**Assumptions, Limitations, and Errors:** Lists of assumptions, limitations, and errors are presented in Tables 3-1, 3-2, and 3-3, of Section 3 respectively. In general, SWEG is a very general and flexible combat simulation. There are no restrictions on the types of platforms that can be modeled using the six generic functions of moving, shooting, communicating, sensing, disrupting (i.e. jamming), and thinking defined within the SWEG Conflict Language (SCL). System capabilities and platform tactics are only limited by the data items in the SCL and the user's imagination.

In constructive applications, SWEG is most commonly used for mission- or raid-level analysis. SWEG was not designed to model detailed, engagement-level combat effectiveness, and does not explicitly represent details of sensor or weapon system performance such as dynamic signature fluctuations, detailed signal processing and tracking errors or deceptive ECM, detailed environmental characteristics (such as terrain clutter, multipath, and diffraction), or detailed weapon guidance and miss distance, which are usually required for engagement analysis. SWEG has some capability to model logistic resupply and has been used in multi-day scenarios; however, there are other limitations, such as no maintenance modeling or automatic sortie generation, that would limit its usefulness in campaign analysis.

Of the assumptions and limitations listed in Section 3, relatively few are significant for constructive, mission-level analysis, and there are often "work-arounds" for those that are significant. Two of the more significant model limitations for mission-level analysis are the assumption of perfect sensor data fusion and correlation and the lack of redundancy or backup in the command and control hierarchy. The list of errors in Table 3-3 and in Appendix C seems extensive and may be a consequence of the fact that SWEG has become available only recently to users outside of the ACETEF and is now being used for different types of analysis applications.

**V&V Status and Usage History:** SWEG was developed originally to serve as the real-time asset control executive for the ACETEF located at the Naval Air Station (NAS) Patuxent River, MD. ACETEF is a collection of test facilities that support weapon system research, development, test, and evaluation. As the asset control executive, SWEG is used to control and coordinate the various hardware assets in the different facilities through hardware interfaces. As ACETEF began to participate in other, distributed exercises additional SWEG interfaces were developed including those for the Distributed Interactive Simulation (DIS) and High-Level Architecture (HLA) protocols.

In addition to the use of SWEG at ACETEF, several other uses are described in Section 4. These include a recreation of the Battle of Khafji by the Air Force Studies and Analyses Agency (AFSAA), the Joint Theater Missile Defense (JTMD) distributed simulation, and requirements definition for the Joint Strike Fighter (JSF) program.

The lack of documented V&V and the limited use of SWEG outside ACETEF until recently are indications that SWEG has not established widespread credibility as a constructive analysis tool. Its use has been very narrowly focused as the real-time, asset control executive at ACETEF with very specific hardware interfaces. The more recent use of SWEG in constructive analyses such as the Battle of Khafji by AFSAA and in JSF requirements definition will exercise more of the model's capabilities and involve additional scrutiny of the code and model algorithms and will enhance the model's overall credibility. To date these efforts are still in database development phases, but with adequate data source documentation and disciplined model and database configuration management (CM), SWEG will likely become a more widely accepted analysis tool.

**Documentation Assessment:** The documentation assessment was outside the scope of the task order under which this document was prepared.

**Software Quality Assessment:** The software quality assessment was outside the scope of the task order under which this document was prepared.

